MONTHLY PROGRESS REPORTS

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Philip Morris Research Center
Richmond, Virginia

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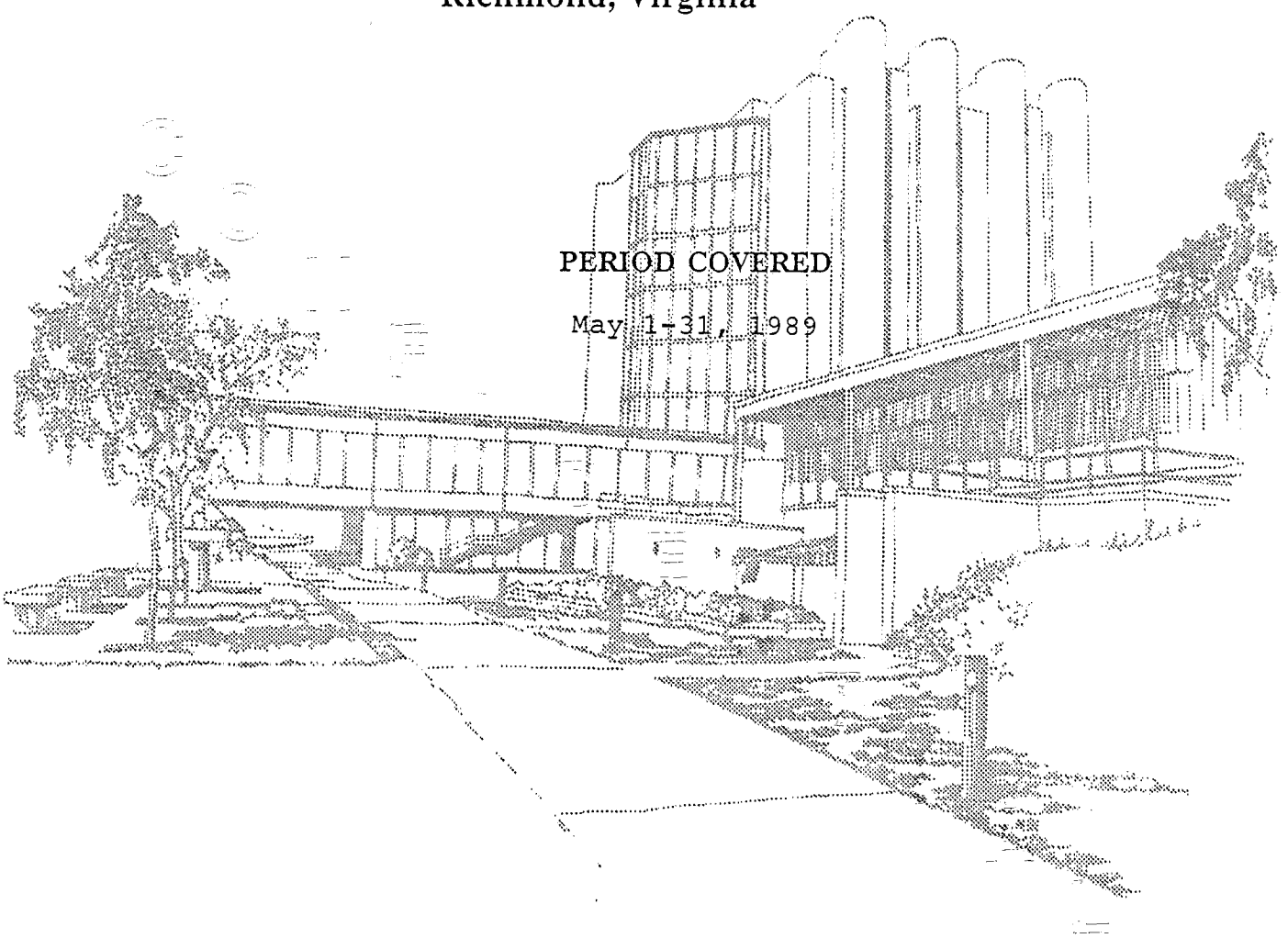
Richmond, Virginia



PERIOD COVERED

May 1-31, 1989

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*N/R = No Report

PROJECT NUMBER: 2107
PROJECT TITLE: Filter Research & Development
PROJECT LEADER: C. J. Campbell
PERIOD COVERED: May, 1989

I. IMPROVED FILTRATION - INCREASED EFFICIENCY:

A. **Objective**: Develop filter systems with a higher efficiency than presently available and evaluate them for subjective advantages.

B. **Status**: An evaluation of the 1.6/41000 tow item from Eastman was completed. Three models of Merit Ultra Lights using 1.6 dpf tow and a control using 2.6 dpf were subjectively evaluated by a Flavor Development panel. A model that delivered the same tar as the control but at a lower ventilation was preferred over the control. This may provide a product advantage and will be used in future development. An evaluation of 1.6/35000 is underway.

Analytical results of five cigarette models made for project 605 were received. The model with a Celanese CA Web dual filter, and one using a 2.6/42,000 tow achieved deliveries of 6.1 and 6.4mg. The three models made with Filtrona peripheral flow concentric filters were too high, with deliveries of 7.8 to 8.4mg. The concentrics have been remade and are now being tested for delivery prior to subjective evaluation.

Six models of non-vented 6mg cigarettes using Project 605 filler were made in Semiworks and analytically tested. Four versions with CA Web and Concentric with CA Web core filters delivered 6.4 to 7.0mg tar and are now being subjectively evaluated by Flavor Development. Two models made with Filtrona UHF filters appear to have significant filter bypass and delivered much higher tars (9.7-11.2mg).

To further characterize the variability of CA Web, cigarettes of one model made with CA Web/CA dual filters were selected according to RTD and tested for delivery. The three RTD ranges of 125-144, 145-160, 161-180mm delivered tars of 6.7, 6.1, and 5.7mg respectively. Samples of these selected cigarettes will now be subjectively evaluated.

II. IMPROVED FILTRATION - MENTHOL STABILITY:

A. **Objective**: Investigate methods of improving the stability of menthol delivery in smoke of aged cigarettes.

B. **Status**: Eleven cigarette models, some with heat treated filters, continue in accelerated ageing conditions with periodic evaluation for stability of menthol delivery.

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III. IMPROVED FILTRATION - NOVEL FILTER SYSTEMS:

A. **Objective**: Develop and evaluate new and unique cigarette filters which may offer a distinct product advantage.

B. **Status**: CONCENTRIC FILTERS: Initial modelling and testing has begun on the development of a dual charcoal/concentric filter with a 3-4mg delivery for Japan.

CARBON FILTER ROD: A comprehensive project status report was prepared and reviewed with Jim Myracle. Efforts will focus on trying to achieve a novel filter design which has customer appeal.

CA PLUGWRAP: The evaluation of a Dexter plugwrap containing a layer of cellulose acetate fibers embedded within the paper structure has been completed. This material was intended to adhere to the filter tow with triacetin so anchor lines could be eliminated and ventilation variability reduced. Sufficient adhesion was not obtained on either the Marlboro Lights or Lark Milds KS models tested.

IV. IMPROVED FILTRATION - SELECTIVE FILTRATION:

A. **Objective**: Explore the use of specific additives in filters for selective filtration or subjective modification of smoke.

B. **Status**: Cigarette models with FML filters containing a new group of additives for subjective modification were made and have been submitted for analyticals and subjectives.

Hercules met with us and offered to provide sample filter rods made from their polypropylene tow for our evaluation. Three samples have been requested for evaluation on Marlboro, Merit Ultra Lights, and FML type (low RTD) cigarettes.

Various treated carbons and paper filters were made and are being evaluated on ART and High Taste/Low Tar models for enhanced response. Recessed fluted filters are also being made and will be tested on similar models.

We are currently awaiting the results of internal panel testing of GCC Marlboro models made with citric acid and ethyl citrate filter additives to compare subjective response with nicotine reduction. Similar testing is planned with Lark models for GCC.

Carbon samples from Calgon and Sutcliffe Speakman have been received and are being tested as alternatives for carbons which are currently single sourced. PICA's 20x70 coconut carbon is the only approved carbon for PM Lights, and Calgon's SCCW coal based carbon is the only approved carbon for Lark.

V. FILTER SUPPORT FOR OTHER R&D PROGRAMS:

A. Objective: Provide design assistance and potential new filter systems for other R&D programs.

B. Status: CARBOWAX REPLACEMENT: Four models of PM Super Lights were sent to Japan on April 7, 1989 for Danchi testing. The results are back and are being evaluated. A report should be issued shortly. Follow up subjective evaluation by the Richmond panel of the twelve week old cigarettes was not conclusive.

Four new models of Parliament Lights 100's for Danchi testing were made at Stockton Street on 5/18 and packed at Semiworks on 5/22. These consist of variations of Carbowax, triacetin, black tow, and white tow. Shipment to Japan is awaiting results from CI. Samples will be subjected to a two week cycle of accelerated ageing and then retested.

The Japan Product Development Group is now coordinating the fabrication of Merit Lights and L&M Milds models with triacetin for Danchi testing.

Carbon-on-paper filters from Baumgartner in a PM Super Lights model along with carbowax controls are being evaluated for gas phase filtration changes due to ageing.

ALTERNATIVE PLASTICIZERS: Six chemicals are currently being investigated as alternatives to triacetin. We are now in the process of identifying suppliers, obtaining data sheets, and requesting samples for evaluation. The six are: triethyl citrate, diethyl tartrate, diethyl malonate, diethyl succinate, diethyl malate, and ethyl levulinate.

LARK SUPER LIGHTS: Sample 27mm plug-space-plug filters submitted by Filtrona England are currently being evaluated. Additional samples made with a high efficiency CA or paper segment at the tobacco end are being requested from Filtrona.

LARK VENTILATION VARIABILITY STUDY: Molins pin perforated filters were produced, attached to cigarettes, and are now being evaluated. The appearance of the pin perforated filters was not acceptable.

Cigarette models are scheduled to be produced in Semiworks on a Hauni Laser the week of May 29 and will then be evaluated for ventilation variability.

Sample bobbins of heat sealable combining wraps are due to be received from Dexter and Kimberly Clark in the near future. This material will be tested in place of the current mechanically perforated combining paper for improved ventilation.

PROJECT NUMBER: 2108
PROJECT TITLE: New Product Technology
PROJECT LEADER: W. T. Callaham
PERIOD COVERED: May, 1989

I. SAUNA

A. **Objective**: Develop a product for the Japanese market utilizing a fluted/charcoal type filter.

B. **Status**: The DATA filter slitter was modified to reduce the depth of the slit into the fluted filter. However, after slitting, the fluted filter section of the combined fluted/charcoal rods tend to slip out of the combining wrap. Additional hot melt guns will have to be installed on the Semiworks combiner to provide a tack line for holding the fluted section intact after slitting. A new nozzle was received for injecting hot melt into the slit of the combined filters. Demonstration is expected sometime in June.

An off-line flute blockage device utilizing a hot wire which melts the plastic is currently being fabricated. This device could be used for the conventional Sauna model as well as the Japanese model. This device will be available for testing the first week of June.

A meeting was held with PM Engineering to discuss high-speed production of Sauna-type products.

C. **Plans**: Demonstrate flute blockage via the slitting/hot melt injection and the hot wire approaches.

Acquire a combiner capability to produce filters in the desired configuration required for the Japanese model.

II. AMBROSIA

A. **Objective**: Evaluate the use of flavor-release compounds in cigarette paper and sideseam adhesives.

B. **Status**: Two flavor-release compounds were coated on cigarette paper using a pipe coating technique. Cigarettes were made with these papers as well as with flavor-containing sideseam adhesive. The preferred flavor, Aromatek-245, was coated again on Trim V outer paper at three levels (solution concentrations: 3.7%, 1.85%, 0.925%), on Trim V inner paper (3.7%) and placed in the sideseam adhesive (2%). Cigarettes are currently being evaluated.

A secrecy agreement was signed and a meeting held with National Starch on the development of suitable adhesives for incorporating flavor-release agents. Two compounds were given to them and preliminary findings are due back from them by June 15.

C. **Plans**: Complete the evaluation of the Trim V/Ambrosia cigarettes and evaluate the Aromatek-245 in existing brands if it still looks promising.

Work with National Starch on development/evaluation of new adhesives.

III. KAYMICH APPLICATOR

A. **Objective**: Evaluate products mentholated via the Kaymich application system.

B. **Status**: Cigarettes were made with foils mentholated via the Kaymich applicator and the PM mentholator. Results after 22 days of lab storage indicate comparable menthol in smoke deliveries and subjective responses. The level of menthol in the filler/filters of each appeared to have equilibrated after approximately 14 days. SOLVIC spot testing of the cigarettes after 22 days indicated the Kaymich cigarettes to have approximately twice the number of spots as did the PM coater cigarettes (52 spots/2000 cigarettes vs. 28 spots/2000 cigarettes). Testing will continue throughout the 30 days of storage.

C. **Plans**: Complete the evaluation of the foil mentholation study.

Evaluate cigarettes made via Kaymich application of menthol to the filler at the maker.

IV. HUMIDOR

A. **Objective**: Develop a moisture release device for use in a cigarette pack which maintains pack OV at the desired level.

B. **Status**: The consumer test in the Middle East was completed and the data is currently being analyzed by an outside consultant. Preliminary results indicate no negative responses to the concept. Subjectively, the Humidor cigarettes were preferred equally to the control, however, they were judged to be different. Final results should be available by mid-June.

C. **Plans**: No further development is planned.

V. EMBOSSING/CALENDERING TECHNOLOGY

A. **Objective**: Explore embossing/calendering technology for potential new product development.

B. **Status**: The final machine parts were received for a new slitter which will be installed on the lab embossing unit. This unit should be operational by the first week of June.

Multiple bobbins of edge-calendered two-ply cigarette papers were prepared for Trim V testing.

C. **Plans**: Complete installation of the new slitter.

Provide samples as required for new product development.

VI. MACHINERY DEVELOPMENT

A. **Objective**: Develop or modify equipment to facilitate the development of new products.

B. **Status**: A Mark-6 plugmaker was retrofitted to a Mini tow machine for experimental filter manufacturing. This machine is now fully operational.

The ESP unit acquired from 20th Street has been installed and is fully operational for perforation of either cigarette paper or tipping.

The third PM mentholator has been qualified for use by R&D and has recently been disconnected for transfer to the Semiworks. This machine should be fully operational by the second week of June.

C. **Plans**: Install a liquid injection system on the Mark-6/Mini plugmaker for evaluation of filter additives/flavorants.

A CA web/paper plugmaker will be installed in the Filter Development lab during the month of June.

Install the PM mentholator in the Semiworks.

VII. ASH TRAY ODOR

A. **Objective**: Develop products which facilitate the elimination of ash tray odor.

B. **Status**: A collaborative program was initiated among Analytical Research, Chemical Research, Flavor Development and Cigarette Technology to address ash tray odor. Two approaches will be taken. First, two different prototype ash trays are being fabricated which will reduce or eliminate the odor. These will be available for demonstration the first week of June.

Second, fractionation studies will be conducted to determine the key components within spent filters responsible for stale odors. Once this is complete, additives will be developed to mask or eliminate the odors.

In the meantime, an odor panel test of the spent filters from Ambrosia cigarettes made with Aromatek-245 will be conducted. Initial smokings of these cigarettes appeared to have reduced ash tray odor.

C. **Plans**: Complete the ash tray fabrication and demonstrate functionality.

Conduct the odor panel test of the Ambrosia cigarette butts.

PROJECT NUMBER: 2304
PROJECT TITLE: Flavor Development/Domestic Product Development/Technology Support
PROJECT LEADER: G. N. Yatrakis
PERIOD COVERED: May, 1989

I. MENTHOL RELEASE COMPOUNDS:

A. Objective: Develop a mentholated charcoal filtered cigarette utilizing a menthol release compound. Also, to apply menthol release technology to other areas.

B. Status: Additional prototypes have been requested with three levels of MGC for design optimization and flavor evaluation.

C. Plans: Optimize procedure and produce prototypes for subjective panel testing.

See New Product Development, 2304, 4015 for cooperative projects.

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PROJECT NUMBER: 2305
PROJECT TITLE: Applied Flavor Investigation
PROJECT LEADER: J. Swain
PERIOD COVERED: May, 1989

I. PROJECT ART

ART-By-Product Utilization:

A. **Objective**: To evaluate and develop process modifications for the utilization of ART process by-product tobaccos.

B. **Status**: Marlboro cigarettes were remade and are under evaluation with pilot RL's incorporating slightly less than 2% ART stem (VSTDL) after HT treatment in combinations with RCB tests of 11% versus 16% ART stem. RL's with burley stem increased to compensate for partial replacement in RCB have shown subjective differences versus 100% RL controls. Intermediate burley stem increase has been recommended for subsequent pilot RL trials with VSTDL from BH.

Initial subjective screening of Hauni Tunnel treated VSTDL from BH showed cleaner attributes than treated stem from pilot ART facility. Comparisons were made at 25% levels in Marlboro type handmade cigarettes.

C. **Plans**:

RCB utilization tests of VSTDL and DLF4	June, 1989
Pilot RL's tests of VSTDL and DLF2	June, 1989
Evaluate pilot DIET with ripper level of DLF4	June, 1989

II. OPERATIONS SUPPORT

PROJECT GRAIN:

A. **Objective**: To significantly reduce alcohol levels in PM flavor systems, while maintaining product subjective integrity.

B. **Status**: Earlier subjective evaluations were encouraging for Semiworks trial of Marlboro aftercut with 30% alcohol reduction. Subsequent trials have been made with Cambridge flavor system due to unavailability of Marlboro POL panelists. Initial sonolator trial with 30% alcohol reduction was completed at 20th Street and submitted for analyses.

C. **Plans**:

Cambridge Production Trial	June, 1989
POL Cambridge Test	July, 1989

Emulsion Agent Evaluations — Continue

DRY FLAVOR REPLACEMENT

A. **Objective**: To develop, evaluate and establish specifications for dry flavor replacements.

B. **Status**: Larger scale samples being prepared by vendors based on earlier subjective and analytical results. In addition to sugar and low molecular weight acid analyses, gel filtration chromatography tests have shown quantitative differences relating to degree of roasting of SJB.

C. **Plans**:

Subjective and analytical tests of samples	June, 1989
Establish specifications and visit vendors	July, 1989

PROJECT NUMBER: 2306
PROJECT TITLE: Marlboro Standardization and International Support
PROJECT LEADER: W. R. Bell
PERIOD COVERED: May, 1989

I. MARLBORO STANDARDIZATION

A. **Objective**: Analytical and subjective evaluations of production Marlboro KS/LS.

B. **Status**: Analytical and subjective results for Marlboro Lights (4/17) factory pickup are in progress. Standard VII Run is scheduled for week of July 17 at all factory locations. Preliminary meetings are in progress.

C. **Plans**: Evaluations of Marlboro Lights pickups continue.

II. DOMESTIC CIGARETTE DEVELOPMENT PANEL

A. **Objective**: To provide subjective direction for programs within R&D and manufacturing locations.

B. **Status**: Ten panels completed for the reporting period.

C. **Plans**: Provide assistance as needed.

III. PROJECT NATURAL

A. **Objective**: To develop 85mm and 100mm full-flavored and lights prototypes using blend components and flavor systems which will result in a natural blended product.

B. **Status**: Ten natural models were made for evaluation with controls. Test prototypes included the Marlboro blend with Natural casing and two Natural aftercuts and the Marlboro Lights blend using standard and Natural casings each using two Natural aftercuts. Models submitted for analytical and preliminary subjectives have been completed.

C. **Plans**: Continue subjective evaluations and awaiting analytical results.

IV. INTERNATIONAL SUPPORT

International Brands Smoking Panel

A. **Objective**: Subjective evaluations (rod aroma and smoking characteristics) of cigarette brands in the international market.

B. **Status**: Eleven panels completed during the reporting period as well as three brand profiles and evaluations of Parliament Lights King Size FTB and Merit Lights FTB for Japan.

PROJECT ULTRA-JAPAN

A. **Objective**: Explore the use of new blends, new flavor systems and different construction styles. Cigarettes will be in the low and ultra-low category for the Japanese market.

B. **Status**: Six total blend casing models were subjectively evaluated.

C. **Plans**: Flavor development continues.

LARK DELUXE MILDS MENTHOL (JAPAN)

A. **Objective**: To produce a menthol version of Lark Deluxe Milds to compete with YSL menthol in the Japanese market.

B. **Status**: Prototypes were produced using two existing blends and flavor systems. Each model was produced with and without mentholated filter plugs. Analytical and preliminary subjectives are complete.

C. **Plans**: Complete subjectives and make necessary flavor adjustments.

CANADA (PROJECT RE-ENTER)

A. **Objective**: To develop a blend, casing and flavor system to be used for all Canadian export brands.

B. **Status**: Aftercut and total blend casing are developed. Flavor transmittal is in progress.

C. **Plans**: Monitor factory production of filler at Stockton Street. Subjectively evaluate completed prototypes.

PROJECT RING (KOREA) - BRONZE

A. **Objective**: Development of a product to be competitive to Pine Tree King Size.

B. **Status**: Five flavored prototypes were subjectively evaluated.

C. **Plans**: Additional flavor modifications are in progress.

PROJECT RING (KOREA) - GOLD/PMSL GOLD

A. Objective: Development of a Virginia sweet product for the Korean market.

B. Status: Two flavored prototypes were subjectively evaluated in addition to Pine Tree Golden Lights and Eighty-Eight Lights.

C. Plans: Flavor modification is continuing.

PAN ASIAN MENTHOL - PROJECT CEDAR

A. Objective: Development of free-standing menthol model to compete with Salem Lights (Hong Kong).

B. Status: Finished Marlboro Lights menthol cut filler has been oversprayed with two aftercuts. The PMSL blend was processed with a sweet-type TBC and oversprayed with two aftercuts. Make-pack scheduled for week of May 29, 1989.

MERIT II (HONG KONG)

A. Objective: Development of a product to be competitive with Kent.

B. Status: Six prototypes were subjectively evaluated and a model was chosen for PMI testing vs. Kent. The filler has been processed and pending make-pack.

C. Plans: Release of test pending subjective and analytical evaluations.

MARLBORO IMPROVEMENT PROGRAM (AUSTRALIA)

A. Objective: Develop an Australian Marlboro subjectively closer to the U.S. Marlboro.

B. Status: Evaluations completed.

MEXICO

A. Objective: Modifications of the existing Marlboro flavor system to be brought in line with U.S.

B. Status: Additional testing of current Marlboro vs. Montana and modified Marlboro prototypes are planned for June.

PROJECT NUMBER: 2307
PROJECT TITLE: Basic Flavor Investigation
PROJECT LEADER: R. W. Hale
PERIOD COVERED: May, 1989

I. ANALYTICAL SUPPORT:

A. Objective: To provide analytical support for activities related to development and application of flavoring materials.

B. Results:

1. Glycerin/Triacetin: The remake of the triacetin blend study cigarettes is scheduled for the week of May 29, 1989. Initial subjective evaluation is in progress on the triacetin blend ratios (using an aerosol generator) to determine if this technique can be used for rapid screening. Two new samples of glycerin and triacetin were received to be used for subjective evaluation and as an analytical reference.

2. Marlboro Standardization: The analyses of flavor components and preblends are in progress for Standard Run VII.

3. External Analytical Support: Analyses of anethole and vanillin on 12 filler samples have been completed for the aftercut application optimization study in Semi-works.

   A total of 18 samples of Burley Spray (00-303) were analyzed for glycyrrhizic acid content by the standard HPLC procedure.

4. Miscellaneous Internal Analytical Support: Analyses were run on 8 casings and 4 aftercut samples. GC profiles were run on 6 menthol samples, one flavor and one flavor component.

II. BASIC FLAVOR INVESTIGATION:

A. Objective: To develop basic and applied knowledge for the purpose of flavor improvement or modification of existing products and to provide the basis for development and application of flavor technology for new, unique products.

B. Results:

1. Low Tar/High Flavor: The TPM from Marlboro 100's (14 cartons) was collected using an impaction trap. This TPM will be used to develop procedures for separation, isolation and identification of the smoke components. GC column selection and optimization of instrument parameters continue.

2. ART: Laboratory and pilot scale Size Exclusion separations of ART tobacco extracts were run to provide varying molecular weight fractions to Analytical Research for determination of extractable versus nonextractable residual nicotine.

PROJECT NUMBER: 4009
PROJECT TITLE: Development Smoke Studies
PROJECT LEADER: B. L. Goodman
PERIOD COVERED: May, 1989

I. Reduced Sidestream Cigarettes:

A. Objective: Develop subjectively acceptable cigarettes with reduced sidestream visibility.

B. Status:

Trim V: Trim V cigarettes with two different blends were tested on the M/C Panel. One model was made in the standard Trim V configuration, and the other model had a modified blend suggested by the Leaf Department. The modified blend utilized #8 Bright, DBC Burley, MT Oriental, and RLTC. No differences were seen in mainstream deliveries or in sidestream visibility. The M/C Panel found no significant differences in Acceptability, Off-taste, or Added Flavor. There was a difference in the perceived Strength, with the modified blend being higher.

Ultraslim cigarettes were made with three different papers made by Chemical Research personnel at the University of Maine. All three papers were coated on the sizepress with succinate, CMC, and MAP. The only difference between the papers was in the level of $CaCO_3$ (25, 35 and 45%). The cigarettes are awaiting data. Regular circumferences were also be made with these papers.

Lotus: The Trim V paper system was evaluated on 24.0 circumference, 100 mm models at regular and high density. Both models gave indications of off-notes and had low acceptability with the Studio panelists. In order to give better visibility reduction in the standard circumference configuration, the outer wrap was overcoated with a low amount of CMC and MAP. Cigarettes with these papers are awaiting evaluation.

The outer wrap base paper was coated on the sizepress with several different compounds in an effort to find a more subjectively acceptable fluxing agent or one that reduces sidestream more than 50% on a standard circumference cigarette. The first two additives tested were potassium bicarbonate and mixed carboxylic acids, which gave 40 and 50% reduction respectively. Neither model gave improved subjectives.

Previously initiated work with $Mg(OH)_2$ paper was completed. A 15% paper used with DeMauduit's innerliner gave as much sidestream reduction as the single wrap 35% $Mg(OH)_2$ paper. The ash appearance was better, and subjective screening indicated that the newer double wrap version tasted better.

II. Sidestream Visibility Measurements:

A. Objective: Determine sidestream visibility of experimental models and methodology for measuring smoke.

B. Status: Testing was conducted on the eight port instrument for the purpose of qualifying it through U. S. Testing. In the first round, three cigarette models of 100 mm length and standard circumference were used; a control conventional cigarette (Marlboro Lights), a low sidestream model (35% $Mg(OH)_2$ paper), and one model giving visibility between the two extremes (single wrap K-C paper). Each model was burned twice a day for five nonconsecutive days. The data was averaged and analyzed for differences between runs before being forwarded to U.S. Testing. Relative concentrations for the three models averaged 1.53, 0.39 and 0.89 respectively. The standard deviation ranged from 0.05 to 0.10.

In addition to burning cigarettes, a series of six optical density filters were placed in the path of the laser beam. These filters gave constant transmission values, and had been calibrated by the manufacturer at different wavelengths. The calibrating value at 550 nanometers gave excellent correlation with the computer output from the eight port system. In the future, one of these filters will be tested daily as an additional control.

The second round of burning for qualification was initiated. This time, the cigarettes were not selected to be as different as the first time in sidestream reduction. Again, five days of replicate burns will be done and the results reported to U. S. Testing.

Commercial brands were surveyed for sidestream visibility. A total of sixteen 100 mm brands were burned. With ten replications, the Trim V model gave 70-77% reduction relative to most brands. The exceptions were Capri and Vantage Excel, where Trim V showed reductions of 63-66% and 26% respectively.

The single port instrument was used for measuring visibility of handmade cigarettes with solgel treated papers. As much as 60% reduction was seen for the paper having both solgel and succinate additives.

PROJECT NUMBER: 2304, 4015
PROJECT TITLE: New Product Development
PROJECT LEADER: G. N. Yatrakis, J. B. Easley, and J. L. Spruill
PERIOD COVERED: May, 1989

I. LOW TAR/HIGH FLAVOR:

A. Marlboro Ultra Lights

1. Objective: Develop 85/100 mm Ultra Low (6 mg) candidates for Marlboro line extensions.

2. Status: 85 mm and 100 mm box products produced in Cabarrus and found subjectively acceptable.

3. Plans: Monitor test market samples.

B. Project 605

1. Objective: Develop a 6mg free-standing cigarette which appeals to flavor low smokers.

2. Status: Cigarettes have been made with Blend A and CA, CA-web/CA and peripheral flow concentric (pfc) filters for internal testing. The pfc filter models were remade with 50% filter ventilation to reduce tar. Filters for the pfc remakes were produced at Filtrona with porous plug wrap in order to provide better machineability. The CA and CA-web/CA models have been submitted for internal testing.

3. Plans: After analytical and subjective evaluations, pfc filter models will be submitted for internal testing.

C. Merit Super Lights

1. Objectives: Develop a 2mg Merit line extension for U.S.

2. Status: Models have been requested to evaluate two new total blend casings using Blend 3 (35/15% burley/bright partially expanded). The preferred casing from these models will be applied to a blend using 50% partially expanded burley with cigarettes made using the CA-1.6dpf filter.

3. Plans: Evaluate new casings and cigarette models.

D. Novent

1. Objective: Develop a 6 mg tar cigarette without filter ventilation.

2. Status: Prototypes using 605 blend A and 100% XTH blend, both with CA and CA-web filters are scheduled to be made week of 6-5-89.

3. **Plans**: Pending analytical confirmation of tar deliveries; subjectively evaluate products for blend and casing direction.

II. TRIM I:

A. **Objective**: To develop ultraslim product candidates with 17mm circumference that demonstrate product advantages over Capri and Capri Menthol.

B. **Status**: Re-evaluation of blend, casing and aftercut is in progress.

C. **Plans**: Prototypes will be made based on the re-evaluations.

III. LOW SIDESTREAM:

A. Trim V

1. **Objectives**: To develop ultraslim product candidates with 17mm circumference with reduced visible sidestream that demonstrate product advantages over Capri and Capri Menthol.

2. **Status**: POL 7185 (Trim V vs. Trim I Model 2 regular) was shipped. POL 7186 (Capri vs. Trim V) has been submitted to Richmond Panel. POL 9090 (Capri vs. Trim VI - Trim V with increased menthol) will be overwrapped the week of 5-30-89. HTI 8764/11043 (VSSS vs. Capri) and HTI 8765/11044 (VSSS Menthol vs. Capri Menthol) have been shipped.

3. **Plans**: POL and HTI testing will be ongoing with test market scheduled for September.

IV. CARTIER:

A. **Objectives**: To develop a Cartier similar to Europe's product for the U.S. market.

B. **Status**: Famous IIA and IIB prototypes and Virginia Slims Lights were selected for consumer testing. Uncertainty concerning the packer "ready" date has resulted in the three models being made in 100 mm softpack configurations for the Mall Placement tests.

C. **Plans**: Mall Placement tests scheduled for June.

V. PARLIAMENT LIGHTS L.S. FTB MENTHOL:

A. **Objectives:** To develop a Parliament Lights Long Size Flip Top Box Menthol product acceptable to the U.S. Market.

B. **Status:** Ad/pack shipped 5-4-89. Results pending.

C. **Plans**: Test Market to be decided.

VI. PROJECT TOMORROW:

A. **Objective**: Develop improved product candidates utilizing materials, designs and technologies currently under development.

B. **Status**: POL 3617 rejected for low dilution. Remake is scheduled for week of 5-29-89.

C. **Plans**: Analytical and subjective evaluations of POL 3617.

VII. PROJECT AMBROSIA:

A. **Objective**: Develop a 23.0 mm circumference aromatic sidestream product and apply this technology to other products.

B. **Status**: The outer wrap for the Trim V product was coated with three levels of Aromatek 245. Cigarettes, in the Trim V configuration, will be made on the pilot maker in Semi-works the week of 5-29-89 using unflavored Trim V filler. Additional models will also be made with the Aromatek 245 in the sideseam adhesive. National Starch has stated that the signed confidentiality agreement is in the mail.

C. **Plans**: Continue to optimize our paper application technique. Upon receipt of confidentiality agreement, request adhesive samples with Aromatek 245 added at time of manufacture.

PROJECT NUMBER: 4022
PROJECT TITLE: International Product Development
PERIOD COVERED: May, 1989
WRITTEN BY: A. H. Confer

I. MARLBORO IMPROVEMENT (Mexico)

A. **Objective**: Move the Mexican Marlboro closer to the USA product by standardizing the casing/flavor system.

B. **Results**: A prototype Marlboro was fabricated at CIGATAM using Aftercut concentrate and Burley Top Casing concentrate from Richmond with locally sourced bulk ingredients. This prototype was tested vs. current Mexican Marlboro in a PMI product test. Results were "In overall preference, current Marlboro was directionally preferred (56/44) over the prototype. This is primarily due to the fact that women, light/medium smokers and older smokers (25-44) significantly preferred the current Marlboro. Younger smokers (under 25), heavy smokers and men, on the other hand, showed equal preference for both products."

C. **Plans**: The prototype will be test marketed (in Leon and Morelia) with three waves of consumer survey (July 1, October 1, January 1).

II. MARLBORO IMPROVEMENT (Uruguay)

A. **Objective**: Move the Uruguayan Marlboro closer to the USA product by optimizing the blend and casing/flavor system.

B. **Results**: Three Marlboro prototypes were fabricated at Abal Hnos.: P6 (new blend), P6-OR (new blend blend with Oriental flavor), and M1 (new blend with Oriental tobacco). The prototypes (plus control) are in C.I. analysis.

C. **Plans**: Following Richmond Panel evaluation and recommendation, consumer testing of the selected prototype is expected to begin in early July.

III. PROJECT DRAGON (PRC)

A. **Objective**: Develop a "blended" KS cigarette to be a non-PM trademark owned and manufactured by CNTC. Tar targets: 17-19mg (GCF-2 factory), and less than 15mg (ZCF factory).

B. **Results**: Four prototypes were received from GCF-2 and four prototypes were also received from ZCF. C.I. analysis was completed on all prototypes.

C. **Plans**: The prototypes will be subjectively evaluated, and recommendations will be made to both factories.

IV. PROJECT CEDAR (Pan Asia)

A. **Objective**: Develop a product to compete with Salem Lights in Asian markets.

B. **Results**: Eight prototypes (2 blends, 2 casing/flavor systems, flush and recessed filter versions) were fabricated. The prototypes are currently being evaluated subjectively and analytically.

C. **Plans**: One or more of the prototypes will be recommended for blind product testing vs. Salem Lights.

PROJECT NUMBER: 4024
PROJECT TITLE: Japan Product Development
PROJECT LEADER: S. B. Nelson
PERIOD COVERED: May, 1989

I. MERIT LIGHTS

A. Objective: To develop a 7 mg tar product to compete with Mild Seven Lights among mainstream Japanese smokers.

B. Status: Production of Merit Lights KS Box was initiated in Cabarrus. The national introduction is scheduled for August 1989.

II. LARK 1989 PROGRAM

A. Objective: To optimize the subjective acceptance of the Lark family while retaining the Lark character.

B. Status: The PMI test results of the current Lark Milds blend versus the GLC-3 blend indicate a directional preference and an higher rating for the GLC-3 blend among Lark Mild and Cabin Mild smokers. Mild Seven smokers indicate equal preference for the two blends but rated the GLC-3 blend higher.

The PMI test results of Lark Milds with the GLC-3 blend versus Cabin Mild indicate a directional preference and a higher rating for Cabin Mild among Lark Milds and Cabin Milds smokers. Mild Seven smokers indicate equal preference but rated Cabin Mild higher.

The Danchi test results of the Lark Super Lights blend/tar evaluations were received and analyzed. The results indicate there was no statistical difference between the current and GLC-3 blends on the liking scale. In addition there was no difference on the liking scale with Lark Super Lights and the GLC-3 blend at 7.0, 8.0 and 9.0 mg/cigt. FTC Tar level.

The PMI tests of Lark Super Lights current versus GLC-3 blends at 9.0 mg/cigt. FTC Tar and Lark Super Lights current blend at 9.0 mg/cigt. FTC Tar versus the GLC-3 blend at 7.0 mg/cigt. FTC Tar are expected the week of June 12th.

The Lark Danchi test results to evaluate the current versus GLC-3 blend and lower tar deliveries are expected the week of June 12th.

Two Lark Deluxe Mild Menthol models were produced and submitted for analytical and subjective evaluations.

Studies continued to evaluate how to reduce the variability in ventilation in the Lark family. In addition, studies were also continued to evaluate higher efficiency filters to maintain current tar delivery while reducing ventilation and reducing tar without increasing ventilation or RTD.

III. CHESTERFIELD

A. Objective: To develop an 11 to 12 mg tar American blended product.

B. Status: The Danchi test of three Chesterfield blends and Lucky Strike was made and shipped. The three blends included GLC-3, Famous, and Target each with the 2B flavor system. Results are expected the week of July 3rd.

IV. ULTRA LIGHTS

A. Objective: To develop an ultra light product for the Japanese market.

B. Status: The Danchi test to evaluate two ultra lights models -- Mount blend and Natural Blend "E" at 5.0 mg/cigt. FTC Tar levels -- were produced and shipped. These two models will be tested with Caster and Caster Milds. Results are expected the week of June 19th.

V. PM LIGHTS

A. Objective: To evaluate alternative types of expanded tobaccos for the current blend.

B. Status: The Danchi test to evaluate alternative types of expanded tobaccos -- DIET and BFET -- as a replacement for the current FODET in the PM Lights blend was produced and shipped. Results are expected the week of June 19th.

PM Lights cigarettes with domestically sourced flax cigarette paper were subjectively approved as a replacement for the currently used European sourced wood-pulp cigarette paper.

VI. CARBOWAX REPLACEMENT

A. Objective: To evaluate alternative plasticizers for the replacement of carbowax.

B. Status: The Danchi test to evaluate Parliament 100's with triacetin replacing carbowax and white replacing black tow was produced and submitted for analytical and subjective evaluations. This test is expected to be shipped the week of June 12th and results available the week of July 17th.

The Danchi test to evaluate Merit Lights and L&M Milds with triacetin replacing carbowax was produced and submitted for analytical and subjective evaluations. This test is expected to be shipped the week of June 5th and results expected the week of July 10th.

VII. BACKGROUND TESTING

A. **Objective**: To assess the impact of products labelled "Made in USA" versus "Made in Japan" at two different prices on Japanese consumers' subjective responses.

B. **Status**: Labels printed with "Made in USA" and "Made in Japan" at 220 Yen and 250 Yen have been ordered. The test is expected to be shipped in August, 1989 with results expected in September 1989.

VIII. JAPAN MARLBORO

A. **Objective**: Improve the subjective response of Japan Marlboro manufactured by JTI.

B. **Status**: Discussions were held with PM Asia and JTI to arrange for the following:

- Production of prototypes of Japan Marlboro KS and 100's @ 15.5 mg/cigt. FTC tar with the incorporation of filter ventilation at JTI's facilities.

- A review with JTI and JTI's packaging printer and ink suppliers to review PM's residual solvents in packaging materials program.

- A revised sampling procedure of Japan Marlboro and Marlboro Lights during production.

A meeting is tentatively scheduled for the week of June 12, 1989.

PROJECT NUMBER: 5001
PROJECT TITLE: Packaging Studies
PROJECT LEADER: H. R. Dunaway
PERIOD COVERED: May, 1989

PACKAGING STUDIES

A. **Objective**: Provide technical packaging support to Manufacturing, Manufacturing Services, Engineering, Purchasing, and Quality Assurance. In addition, assist New Products Directorate in evaluating new packaging concepts and products.

B. **Status/Plans**:

Residual Printing Solvents in Packaging Materials: Coordinated evaluation of the following items:

- L&M 100 Men SP 20
- Eastman GPK 200 Water Lacquer
- Lark Milds Yellow XP-12,466 Ink
- Findley Nip Weld Cohesive C1059-02
- Ecusta Cork Tipping Components (base paper, printed paper, ink)
- Va Slims Offset Carton Insert
- L&M KS SP 20
- Next Ultra Low Tar 100 Reg & Men Tipping Paper
- Next Low Tar Reg & Men KS SP 20
- Unprinted Indonesian Label Stock
- Next Ultra Low Tar Reg & Men KS SP 20
- Next Low Tar Reg & Men KS SP 20/200
- Next Closures (5 versions)
- Marlboro Cork Tipping Inks from Col. Hgts. Pkg.:

Toluol Free Cork Brown	RNC-5896
Alcohol Cork Brown	RNC-1409Z
Alcohol Extender	RWC-1259Z
Tipping Extender	RWC-5894

- Experimental Trim FT 20 on Gemcote Board
- Next Ultra Low Tar Men KS SP 20/200
- AOCO-34901 Oasis Gloss Over Lacquer (J&B)
- Marlboro LS FT 20 with the following two ink systems:
  - Water Red #RRW-6433B & Water Lacquer #SWG-700-450
  - Red #RJC-5640 & Water Lacquer #W557

Fiber-Lam, Inc. Shipping Cases: Sample cases have been ordered to conduct a ship test to Phoenix, Arizona during the summer months, and additional testing under controlled conditions to include comparison to carton overwrap and menthol retention.

Cartier: A spotting and staining study was conducted of seventeen Cartier models. Results are currently being tabulated.

PROJECT NUMBER: 0400
PROJECT TITLE: Low Density Rod Development
PROJECT LEADER: R. S. Mullins
PERIOD COVERED: May 1989

I. LOW DENSITY ROD

A. **Objective**: Develop a continuous process for the production of reduced density cigarettes.

B. **Results**: Production of various low density cigarette models for sidestream studies was completed. Several problems were encountered with the sideseam not sealing properly when using the coated paper. Production of samples to support binder application studies by Project 1503 continued.

Additional moisture was successfully applied to the tobacco rod using an ultrasonic nozzle inserted through the top of the modified steaming garniture. At 1000 cpm, the OV of the filler was increased by an additional 4% over that obtained with steaming alone. However, attempts to produce a bound rod by using this approach to apply a 2% pectin solution to uncoated tobacco were unsuccessful.

C. **Plans**: Produce samples as requested by Project 1503 for binder application studies. Evaluate the impact of moisture addition to the tobacco bed on cigarette quality.

II. Molten Menthol Application to Foil

A. **Objective**: Evaluate the Kaymich menthol applicator as a means of applying menthol to foil without the ethanol carrier.

B. **Results**: After 21 days of aging, the distribution of menthol in cigarettes packed in foil mentholated with the Kaymich continues to be very similar to that of cigarettes packed using standard MOF. In subjective evaluations conducted by Dave Spruill of New Product Technology, neither model was found to be subjectively superior to the other after either 14 or 21 days of aging.

In order to ensure that additional work undertaken to develop this process will be applicable to our production coating operation, future development will be done using the PM coater being installed in Semiworks, rather than the previously used Rothmans coater. The PM coater has been relocated from the Engineering lab to the Semiworks and installation of utilities for it is pending.

A MicroMotion mass flow meter has been installed in Semiworks near the Rothmans coater for use in monitoring the performance of the Kaymich applicator.

C. **Plans**: Install the Kaymich unit on the PM coater being installed in Semiworks. Determine the effect of residence time on foil contamination. Establish the operating conditions which minimize the retention of menthol on the foil face. Determine the maximum loading of menthol on the foil obtainable with this process.

PROJECT NUMBER: 1307
PROJECT TITLE: Reconstituted Tobacco Development
PROJECT LEADER: R. G. Uhl
PERIOD COVERED: May, 1989

I. IMPROVED SHEET PROPERTIES

A. **Objective**: Improve the physical characteristics and blend properties of reconstituted sheet materials.

B. **Results**:

1. ART Project - Blended cigarettes combining BL Plant RCB sheets and pilot RL sheets made with ART Pilot Plant stems were remade (atypical control) and are being subjectively screened.

   Final screening results indicate that pilot RL subjectives are comparable when incorporating either the bottom 97% of the ART stems (wax layer removed) or bottom basket stems (neither one Hauni tunnel treated), or total ART stems that did receive Hauni thermal treatment. RL sheets incorporating the wax layer stems have also been produced for evaluation. Hauni tunnel treatment improves ART stem subjectives in RL, but utilization is still limited to 1.8% of the RL feedstock. Hauni tunnel treatment is being employed at Bermuda Hundred.

   Pilot RL sheets containing exagerated levels (300% utilization) of various ART stem types were made into 100% cigarettes for smoke chemistry analysis.

   Absorber stems are now available from Bermuda Hundred and these will be employed in future stem utilization efforts. Screening in handmade blends indicates that the initial Bermuda spent stems have better smoking qualities than ART Pilot Plant stems. Trials incorporating Bermuda stems (from test market runs) in BL Plant RCB at 11% and 16% levels (replacing burley stems) are scheduled for the first week in June.

   Leaf Department projections show burley stems rising in RL feedstock; an additional increase will be required to maintain target durations if ART stems replace part of the burley stems in RCB. Pilot RL sheets are being made at higher burley stem levels to determine subjective limits. Trials will subsequently be requested at Park 500 to evaluate an acceptable blend, both with and without Bermuda absorber stems.

2. Humectants - PG/G-free strip casings with isosweet (two of the nine formulations tested in blends) continue to provide the best subjectives. Small-scale cigarettes are scheduled in order to finalize isosweet level (50-100% w/w replacement for PG/G); the selected level will then be verified on large scale.

C. **Plans**:

1. Complete subjective evaluation of blend combinations of pilot RL and BL Plant RCB containing ART Pilot Plant stems.

2. Conduct BL Plant trials incorporating Bermuda stems in RCB.

3. Complete evaluation of higher burley stem content in pilot RL.

II. SUBJECTIVE MODIFICATION OF RL

A. **Objective**: Improve or modify the subjective character of RL.

B. **Results**: Flavor Development has requested larger (multiple lot) quantities of liquid flavors from Chart and Takasago. These will have sugars asjusted to final specification in the Flavor Center. Pilot 150B without dry flavors has been provided for initial screening of the compounded liquid flavors (laboratory spray application); viable candidates will then be evaluated in pilot 150B prior to sheet plant trials. Blends of flavors from the two vendors will also be tested. Flavor Development has requested Chart to obtain the necessary analytical capabilities to monitor flavor specifications, and plans to issue specifications to Takasago in June.

C. **Plans**: Produce pilot 150B to evaluate compounded liquid flavors.

PROJECT NUMBER: 1308
PROJECT TITLE: Papermaking Process Development
PROJECT LEADER: R. M. Rogers
PERIOD COVERED: May, 1989

I. HANDSHEET PRODUCTION

A. **Objective**: Develop proprietary cigarette papers for low sidestream and other new product applications.

B. **Results**: Precipitated sol-gel produced from alkoxide consistently retards sheet drainage and reduces sheet porosity. Handsheets can be successfully produced at a 10%/20% ratio of sol-gel/carbonate resulting in 5 to 6 Coresta porosity. Incorporating higher levels of this material increases burn time beyond acceptable limits. Preliminary samples from New York Polytechnic University (slurry form), produced to develop pilot scale production capabilities for a paper run at Maine, exhibit similar properties. Light extinction performance is comparable to Ecusta's $Mg(OH)_2$ commercial papers prorated to the same static burn time.

Sol-gel's tendency to tighten the sheet not only restricts this filler's level to 10% but necessitates the use of semirefined fiber which is detrimental to sheet appearance. One of New York Polytechnic's samples, produced using the inorganic process, exhibits sheet making properties much like carbonate though the subjective character is unacceptable.

Evaluations of five different fiber types indicate that the flax currently utilized exhibits the highest strength properties. Since a number of experimental fillers produce sheets with unacceptable high or low porosity, alternate fibers are being investigated. The other fibers allow production of substantially more porous sheets with acceptable appearance but lower strength properties (tear and tensile).

A variety of handsheets with different fillers were produced this month including multilayer $Mg(OH)_2/CaCO_3$ combinations, hydrotalcite and vanilla treated hydrotalcite. Sidestream smoke performance is being evaluated. A basis line study was completed comparing various sheet weights at constant filler content. Other studies showed that no additional reduction in sidestream smoke delivery could be obtained by increasing calcium carbonate content beyond current levels. RLTC handsheets were produced incorporating 30% calcium carbonate as an agent to reduce sidestream smoke. Additional tests must be conducted before results can be analyzed.

C. **Plans**: Continue the preparation of handsheets to evaluate designed fillers, sol-gel preparations, and burn additives.

II. PILOT PRODUCTION

A. **Objective**: Produce pilot quantities (bobbins) of cigarette paper.

B. **Results**: Hydrotalcite pilot sheets at 30% and a 15%/15% hydrotalcite/carbonate mix have been produced at Maine following favorable subjective and sidestream smoke evaluations of handsheets. Sheets incorporating 30% hydrotalcite continue to limit sheet porosity to 12 Coresta or greater. In the absence of a sizing agent, sheet weight must be adjusted to achieve lower porosity values and an acceptable burn rate.

The current shipment of flax being utilized is much harder to refine resulting in longer fiber length. The net result is a reduction in the sheet's appearance, exemplified by recent production at Maine. Although the sheets can be utilized for machine made cigarettes, additional refining evaluations will be incorporated into the schedule to improve the appearance of subsequent sheets.

A vergeure roll and a second stock screen for the secondary headbox will be operational at Maine by mid June when additional papermaking trials are scheduled. The vergeure roll will be installed in the second press position for marking cross directional lines on either the top or bottom of the sheet. The second stock screen will be installed prior to the top headbox to improve the appearance of the top layer of bilayer sheets by removing fiber flocs.

C. **Plans**:

1. Produce modifications of Trim papers, both individual sheets and bilayers.

2. Provide the capability to apply vergeure lines on cigarette papers and install a stock screen for the top headbox.

PROJECT NUMBER: 1503
PROJECT TITLE: Modified Smoking Materials
PROJECT LEADER: W. A. Nichols
PERIOD COVERED: May 1989

I. LOW DENSITY ROD - BINDER APPLICATION

A. **Objective**: Produce precoated filler via the batch or continuous process to support the current product and process development efforts on the low density rod program. Develop a method of pre-applying binders to the tobacco in a manner that can be scaled up to commercial scale.

B. **Results**: A tobacco clump separator was installed at the exit of the coating cylinder to quantify the percentage of satisfactorily coated filler. Initial tests indicate 97.7% of the coated filler is satisfactory. The separator will be used to optimize processing conditions.

At 25% weight reduction, cigarette firmness values have deteriorated compared to last year. In an effort to understand this problem, the effect of pectin solution concentration and tobacco blend is being evaluated. Dilute spray solutions of 2% pectin were used to produce 4% and 6% add-on levels to Marlboro filler. Cigarettes were made and submitted for testing.

C. **Plans**: Further experimentation will be done to determine why firmness values have decreased.

II. BINDER TECHNOLOGY

A. **Objective**: Investigate the mechanism of filler bonding and stiffness produced by coating. Improve commercial feasibility by examining alternate binders and processes.

B. **Results**: Cigarettes produced from coated filler were reactivated in the laboratory steam reactivation chamber. Resulting firmness values were similar to cigarettes produced on the Low Density Rod Maker. The reactivation chamber will be used to optimize process conditions and screen alternate binders.

Filler was coated at a 6% add-on from a 6% potato starch (Staley Redisol 248) solution in the laboratory tumbler. Reactivation of handmade cigarettes indicated satisfactory filler bonding. Similarly coated filler was produced on the batch process for use in producing machine-made cigarettes.

C. **Plans**: Cigarettes produced from filler coated with potato starch and potato maltodextrin will be tested for firmness and subjectives.

PROJECT NUMBER: 1806
PROJECT TITLE: New Tobacco Processes
SECTION LEADER: S. R. Wagoner
PERIOD COVERED: May, 1989

I. PROJECT ART - COMMERCIAL PROCESS DEVELOPMENT

A. **Objective**: To conduct trials providing information for development of the ART commercial process.

B. **Results**: Assistance was provided in the coordination of the Bermuda Hundred start-up with respect to product qualification. Bermuda Hundred extracted filler was expanded in D Pilot Plant for use in finished blends processed in the Semiworks and for comparison to filler expanded at the MC.

Nicotine data from the initial expansion runs at the MC using Bermuda Hundred filler showed no contamination as the values of the feed filler and the expanded products were not significantly different. Operationally, the major concern was that after a single impregnation cycle, the top three inches of the bed were not fully impregnated. This appears to have been alleviated by using a one minute soak time in the impregnator. Also, the lower tower temperature and higher exit tower moisture required for the product caused some difficulty in controlling the reordering cylinder operation.

QE SOLVIC defect counts were conducted on the initial cigarette models produced from Bermuda Hundred filler. In general, the analyses yielded 40-60 critical spots/2000 cigarettes. Monitoring of cigarettes will continue, and a program is being coordinated with the Bermuda Hundred facility in an effort to reduce the spotting level.

A replacement keypad was delivered and installed on the Infrared Engineering on-line nicotine/OV monitor. The unit appears to be operating correctly, and installation in the Semiworks is proceeding.

C. **Plans**: Assist in the effort to reduce the spotting level of cigarettes produced from Bermuda Hundred filler.

Evaluate the Infrared Engineering monitor (nicotine, moisture) after installation in a Pilot Plant situation.

II. HAUNI HT TUNNEL EVALUATION

A. **Objective**: Determine the effect of steam conditioning tobacco materials in the Hauni HT steam tunnel prior to drying.

B. **Results**: A third set of tests was conducted processing DIET feedstock and product through the Hauni HT tunnel to verify last month's results which showed a reduction in the level of spotting

in cigarettes made from these materials. Spotting and subjective analyses of these cigarettes are in progress.

Three of the four tests from the initial evaluation series were completed to determine the effect of processing filler through the HT tunnel on cigarette firmness. The first test was a paired comparison with the previously tested WD tunnel, while the second and third tests evaluated tunnel speed and tobacco throughput, respectively. The initial test showed a firmness increase of 0.3 mm for the HT treated test versus the non-tunnelled control. Cigarette results from the other runs are not yet available.

C. **Plans**: Assuming continued positive results from the third set of tests described above, run a large scale test processing DIET feedstock through the HT tunnel.

Run the fourth test in the series evaluating the effect on cigarette firmness. Complete physical and subjective analyses on all four runs.

III. TMCI-ASTA SHEET

A. **Objective**: To develop a subjectively and physically acceptable reconstituted tobacco sheet using the TMCI process and PM-RCB technology for international application.

B. **Results**: Further evaluation of the laboratory survivability tester confirmed that this is a reliable means of measuring the quality of filler from reconstituted tobacco. The production RCB variation and the standard deviation of six measurements of a single sample is ~3.0%. The average survivability of production RCB filler (6 + 12 mesh) is ~40%.

The study of the effect of air inclusion in slurry, lecithin release agent, and a fouled casting belt on sheet quality is continuing. A major factor adversely affecting sheet strength, in addition to a fouled casting surface appears to be air inclusion in the slurry. An improvement of 30% in tensile strength and also work to break has been seen when air is removed from the slurry and sheets cast in the laboratory. This improvement has been seen in RCB as well as ASTA. Production RCB and laboratory ASTA slurry were found to contain 50 ccs air/kg slurry and 25 ccs air/kg slurry, respectively. Survivability measurements have still to be made on this product.

The bulk density of 20% and 50% stem ASTA blends of different degrees of grinding showed only a small decrease for finer tobacco grinds. Compacted bulk densities were ~50% higher than freefall bulk densities.

Pectin release from the above blends was attempted by measurement of slurry viscosity. Pectin release would be expected to be greater for smaller tobacco particles. Slurry viscosity, however, increased with particle size which suggests that tobacco particle

swelling has more influence on slurry viscosity than pectin release. Higher stem content of the blend accentuated this viscosity increase. Burley stems affected the slurry viscosity most, followed by bright stem and production dust.

C. **Plans**: Quantify the effect of air inclusion in slurry lecithin release agent and a fouled casting belt on filler survivability.

Attempt to measure the rate of pectin release directly from ASTA blends of different grind sizes.

Support TSA in any future trials.

PROJECT NUMBER: 1810
PROJECT TITLE: ART Process Development
PROJECT LEADER: Ravi Prasad
PERIOD COVERED: May, 1989

I. PROJECT ART - COMMERCIALIZATION

A. **Objective**: To provide R&D support during the startup phase of the commercial plant (Bermuda Hundred Processing Facility).

B. **Results**: The Bermuda Hundred Pilot Plant was shut down on May 2, 1989, in order to fully support the Commercial Plant startup. The pilot plant personnel have been assigned to the commercial plant to provide around-the-clock coverage. The startup has been very successful with R&D support provided in the following areas:

1. Modifications to filler and stem loading patterns for uniformity of distribution.

2. Special sampling to pinpoint the bypassing/channeling of CO_2 flow past the stem absorber.

3. Modifications to the CO_2 purge/fill procedure to avoid compaction of filler and stems.

4. Gentler execution of CO_2 "top-off" and "vent-off" steps to reduce pressure drop in the stem bed.

5. Optimization of process conditions to assure target extraction level of 97% nicotine reduction without nicotine breakthru.

The commercial plant is producing subjectively acceptable product meeting target specifications, i.e., 97% nicotine removal.

C. **Plans**:

1. Continue R&D support of the commercial plant until June 15, 1989; as per the original schedule.

2. Startup the pilot plant on June 19, 1989; while supporting the commercial plant optimization through the planning stages.

3. Continue to provide pilot plant data on CD monitor to the commercial plant personnel.

4. Support the testing of Hinds on-line nicotine monitor at the commercial plant, when it is received and installed by the commercial plant personnel.

II. PROJECT ART - BHPP

A. **Objective**: To support commercial plant design and flavor development objectives at the Bermuda Hundred Pilot Plant.

B. **Results**: During the BHPP shutdown period, the following items for construction/maintenance are being pursued:

1. Relocation of the activated carbon oven to the commercial facility.

2. Steam cleaning of the extractor and absorber vessels.

3. Safety inspection and recertification of all relief valves as part of an annual safety program.

4. Rebuilding of CO_2 fill-booster pump.

5. Preventive maintenance of the process chiller.

6. Installation of improved design sump pumps.

7. Miscellaneous house cleaning activities.

The construction of the new building addition to provide office space is in progress. Completion is expected in June, 1989.

A 650 was submitted for a "cooling heat exchanger" for the pilot plant. The projected installation date is January, 1990.

C. **Plans**: Finalize plans for test protocol for the BHPP. Startup the pilot plant on June 19, 1989; assuming successful commercial plant operation.

III. PROJECT ART - NEW PROCESS DEVELOPMENT

A. **Objective**: To develop new processes for scale-up and implementation in the Bermuda Hundred Facility on an as needed basis.

B. **Results**: In response to the DuPont recommendation on corrosion of 316L stainless steel, R. Prasad and J. Washington visited Liquid Carbonic to review the CO_2 processing and sampling procedures. The goal is to investigate methods of reducing oxygen level in CO_2, in order to reduce the potential for stress corrosion cracking.

A process option to reduce the oxygen content of CO_2 via O_2-scavenger catalyst was identified. A confidentiality agreement with Air Products & Chemicals, Inc., will be executed prior to developing this option for commercial application.

The testing of water column "flooding" characteristics at General Foods Technical Research, has been delayed, pending the completion of safety review of the pilot plant by DuPont experts. It is too early to project the impact of this delay on R&D program at PM-USA.

A capital job order request for "batch" liquid column baskets has been prepared. Orders will be placed as soon as funds are approved.

C. **Plans**: Continue development of liquid column concept to remove nicotine from supercritical CO_2.

Evaluate the oxygen reduction option for Project ART.

PROJECT NUMBER: 1811
PROJECT TITLE: Process Chemistry Development
PROJECT LEADER: S. E. Wrenn
PERIOD COVERED: May, 1989

I. PROJECT ART - COMMERCIAL PROCESS DEVELOPMENT

A. **Objective**: To conduct experimentation providing information for development of the ART commercial process.

B. **Results**: To simulate the effect of DAP/NH_4OH on the tobacco waxes deposited on the surface of stem during the ART process, the waxes which were removed from the stem by hexane extraction were refluxed with DAP/NH_4OH. Samples of the reacted material were given to Chemical Research for identification.

Laboratory experimentation to monitor the preparation and storage of AB/PG/G solution indicated that the solution could be stored under 25 psig CO_2 instead of 45 psig as indicated in the procedure for the commercial process. Storing it under the reduced pressure would allow the solution to be held for longer periods than 24 hours. Discussions were held with Bermuda Hundred personnel to explain the laboratory results and the impact on the process. Plans were made to hold an AB tank at Bermuda Hundred under reduced pressure and monitor temperature and ammonia content with time up to 72 hours.

C. **Plans**: Monitor results from commercial process relating to AB storage under reduced pressure. Conduct laboratory investigations to determine why the spray nozzles in the AB cylinders clog during spraying.

II. BINDER DEVELOPMENT

A. **Objective**: To develop binder systems with the desirable physical and subjective characteristics to be used in the foam bonded ends and low density rod programs.

B. **Results**: NaCMC (7L2P)/licorice has been qualified as a binder system for the foam bonded ends program. A NaCMC (7LFPH) of a slightly higher molecular weight was successfully tested on the Molins foamer reducing the loose ends by 75%. Subjective testing is in progress. A binder system prepared from pH adjusted polydextrose has been profiled in the lab for foam collapse and solution viscosity. It appears from the lab data that this material may be useable. Samples of binder prepared from NaCMC/licorice are being supplied to Engineering to support modifications to the foamer and maker.

C. **Plans:** Continue support as required by the above programs.

PROJECT NUMBER: 1101
PROJECT TITLE: Entomological Research
PROJECT LEADER: D. L. Faustini
WRITTEN BY: L. Ryan
PERIOD COVERED: May, 1989

I. ECOLOGY

A. **Objective:** Relate cigarette beetle (CB) ecology to tobacco processing and CB control.

B. **Results**: The monitoring programs established within PM USA's tobacco leaf supply channels by R&D, Leaf and QA department personnel were reviewed at Mr. O. W. Dudley III's staff meeting. This included an overview of the results to date involving: Universal Leaf Tobacco Co.; the flue-cured and burley stabilization "pools" and their processors; offshore suppliers in Brazil; farmers and extension agents in North Carolina and Virginia; and oriental dealers in Greece. Leaf department personnel were enthusiastic about this program and suggested expansion of the program into oriental supplies in Turkey.

C. **Plans**: Continue the global monitoring study; determine trap efficiency; and relate trap CB captures to actual CB population density.

D. **Reference**:

1. Ryan, L. Global Monitoring Program - Update for Leaf Department. Memo to Faustini, D. L. April 26, 1989.

II. FUMIGATION

A. **Objective**: Investigate the use of controlled atmospheres (CA) to fumigate tobacco.

B. **Results**: Collaborative studies with Miller Brewing Co. have been carried out using surplus CO_2 (generated during brewing) to disinfest barley malt silos. These trials were successful, indeed Miller Brewing Co. personnel are implementing CO_2 fumigations at each brewing location in the U.S.

C. **Plans**: Continue to integrate CA fumigation within PM's CB control program. Present to management a recommendation regarding the use of CO_2 to fumigate bulk storage warehouses.

D. **Reference**:

1. Faustini, D. L. Carbon Dioxide Disinfestation - Miller Brewing Co. Memo to Sanders, E. B. April 19, 1989.

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III. SERVICE TO OTHERS

A. **Objective**: To provide technical services to areas outside R&D.

B. **Results**: Advice was given on the following topics: fumigation of PM-80 cases (1); status of methoprene registration in Australia (2); vacuum-steam conditioning cycles necessary to achieve 100% CB mortality (3); and implications of impregnating cases with pesticides (4). PM USA was represented at the TAUS/ICC meeting, topics covered were the proposed amendments to the Dairy and Tobacco Adjustment Act of 1983, potential effects of the inclusion of phosphine on North Carolina's air toxics list, and a presentation made by Zoecon representatives (5).

A presentation was made to Mr. W. R. Moore's staff meeting. The subject was to focus PM USA's integrated pest management program (6).

Five days of hands-on training dealing with CB control were given to a PME employee (7).

C. **References**:

1. Faustini, D. L. PM-80 Cases - Fumigation Conditions. Memo to Puryear, J. A. May 1, 1989.

2. Faustini, D. L. Registration Status of Methoprene in Australia. Memo to Wajntraub, J. May 1, 1989.

3. Ryan, L. Vacuum Conditioning to Kill Cigarette Beetles. Memo to Cooper, R. N. April 19, 1989.

4. Faustini, D. L. Cost Reduction - Impregnate Pesticide in PM 70's and 80's - Response. Memo to Tenhet, J. N. April 19, 1989.

5. Faustini, D. L. T.A.U.S. Insect Control Committee (I.C.C) Meeting - Williamsburg, VA. Memo to McCuen, R. W. April 19, 1989.

6. Ryan, L. & Faustini, D. L. The Integrated Pest Management Program at PM USA. Memo to McCuen, R. W. April 16, 1989.

7. Ryan, L. The Presence of Jean-Marc Freymond in PM USA Manufacturing and Processing Facilities - April, 1989. Memo to Distribution. April 13, 1989.

IV. OTHER

Project 1101 personnel presented a bi-annual update (1), and suggested closer communication within PM Inc. companies about entomology (2).

References:

1. Faustini, D. L. Bi-Annual Update - Project 1101. Memo to Distribution. April 19, 1989.

2. Faustini, D. L. Entomology as a Synergy Topic. Memo to Houghton, K. S. May 10, 1989.